

# Large river fish community sampling strategies and fish associations to engineered and natural river channel structures

by

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## ABSTRACT

I evaluated sampling strategies and the effects of dike structure modifications in the lower Missouri River to better develop sampling and mitigation strategies to protect and enhance native river fishes. Sampling occurred in the lower 1,212 km of the Missouri River during October-June (coldwater season) and June-October (warmwater season) with stationary gill nets (GN), drifted trammel nets (TN), towed otter trawls (OT), and mini fyke nets (MF) from 2003-2006. We compared probabilities of detection ( $p$ ), variability (coefficient of variation; CV) in catch per unit effort, and lengths for 25 species. Over 80% of adult large-bodied fishes were collected in GN during coldwater, >90% of chub spp. (*Macrhybopsis*) were collected in OT, and >90% of nine small-bodied and juvenile fishes were collected in MF. Trammel nets never had the highest  $p$  during coldwater, but had the highest or equally high  $p$  for 85% of adult large-bodied fishes during warmwater. Mean CV was lowest with GN for adult large-bodied fishes; chub spp. had the lowest CV in OT. Mean lengths were typically greater in GN and TN. Large river monitoring programs might best achieve the highest  $p$ , lowest variability, and widest size range of fishes by employing GN and OT during coldwater and TN, OT, and MF during warmwater sampling periods. We also compared fish community composition and the probability an un-notched and notched dike structure and channel sand bar (referred to as channel structures) was occupied by various fish species. Few differences in species richness and diversity were evident among channel structures. Notching a dike structure had no effect on proportional abundance for any habitat guild. Catch per unit effort (CPUE) was greater at notched dikes for only three (lake sturgeon *Acipenser fulvescens*, paddlefish *Polyodon spathula*, and shovelnose sturgeon *Scaphirhynchus platyrhynchus*) of 12 great river species. Occupancy at notched dikes increased for blue catfish *Ictalurus furcatus* and decreased for blue sucker *Cycleptus elongatus*, but did not differ for 17 (81%) other species. No distinct increase in occupancy at natural channel sand bars compared to engineered dike structures was evident. Mean CPUE was higher in dike structures than channel sand bars for four great river species (goldeye *Hiodon alosoides*, lake sturgeon, paddlefish, and shortnose gar *Lepisosteus platostomus*), but did not differ for ten. Our results suggest dike structures may provide necessary habitats for many fluvial species when compared to channel sand bars, but notching did not increase abundance or occupancy of most native Missouri River fishes.